



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/735,370	12/12/2003	John Frederick Ackerman	130013/11921 (21635-0116)	1818
31450	7590	11/13/2006	EXAMINER	
MCNEES WALLACE & NURICK LLC 100 PINE STREET P.O. BOX 1166 HARRISBURG, PA 17108-1166			BAREFORD, KATHERINE A	
			ART UNIT	PAPER NUMBER
			1762	

DATE MAILED: 11/13/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/735,370

Applicant(s)

ACKERMAN ET AL.

Examiner

Katherine A. Bareford

Art Unit

1762

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-17 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-7, 9-11 and 13-17 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

*Claims 8 and 12 are canceled*

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date ____. | 6) <input type="checkbox"/> Other: ____.  |

## DETAILED ACTION

### *Board of Appeals Decision*

1. This Office Action is in response to the Board of Appeals Decision of August 24, 2006. In that decision, the 35 USC 103 rejection of claims 13-17 using Subramanian in view of Stoffer was affirmed. The 35 USC rejections of claims 1-7 and 9-11 under 35 USC 103 was reversed.

In the following Office Action:

(A) claims 13-17 remain rejected under Subramanian (US 6296945) in view of Stoffer et al (US 5932083) as affirmed by the Board of Appeals

(B) claims 1-5, 7, 9, 10 and 13-17 are newly rejected using Villiger et al (US 2001/003631) in view of Vine et al (US 4861618) and Liu, et al "Total Oxidation of Carbon Monoxide and Methane over Transition Metal-Fluorite Oxide Composite Catalysts" Article.

(B) claims 6 and 11 are newly rejected using Villiger et al (US 2001/003631) in view of Vine et al (US 4861618), Liu, et al "Total Oxidation of Carbon Monoxide and Methane over Transition Metal-Fluorite Oxide Composite Catalysts" Article and Ueda et al (US 5697992).

### *Claim Rejections - 35 USC § 103*

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 13-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Subramanian (US 6296945) in view of Stoffer et al (US 5932083).

Claim 13: Subramanian teaches a method for preparing a protected article.

*Column 2, lines 20-40.* The article is provided. *Column 3, lines 50-68.* A bond coat is deposited onto an exposed surface of the article. *Column 4, lines 5-20 and figure 2.* A thermal barrier coating is formed on an exposed surface of the bond coat. *Column 4, lines 50-65 and figure 2.* To form the thermal barrier coating, first a primary ceramic coating is applied to an exposed surface of the bond coat. *Column 2, lines 25-45 (the "base" or "primary" ceramic is preferably yttria stabilized zirconia, for example).* Then a sintering inhibiting material is applied to the surface of the primary ceramic coating.

Art Unit: 1762

*Column 2, lines 25-45, column 5, lines 30-65 and figures 2-3 (the sheath material). The sintering inhibiting region can comprise cerium oxide in a concentration greater than a general cerium oxide concentration in the primary ceramic coating. Column 2, line 65 through column 3, line 10 and column 5, lines 30-50 (cerium (Ce) can be provided as component C of the sheath material, thus providing  $Ce_zO_w$ , and furthermore, C is desirably not the A or B material of the primary ceramic (A = zirconia and B=yttria if yttria stabilized zirconia is used as the primary ceramic, for example)). The resulting applied material can be a stable oxide of  $C_zO_w$ , where C=Ce. Column 2, lines 35-40, column 4, lines 55-65 and column 5, lines 35-4.*

Claim 14: the article is a nickel base superalloy article. *Column 3, lines 50-68.*

Claim 15: the article is in the form of a component for a gas turbine engine.

*Column 3, lines 50-68.*

Claim 16: the step of depositing the bond coat includes depositing an aluminum containing overlay bond coat. *Column 4, lines 5-20.*

Claim 17: the primary ceramic coating can be yttria stabilized zirconia. *Column 2, lines 40-50.*

Subramanian can be considered as teaching all the features of these claims except that the selected stable oxide of cerium is such that a +4 oxidation state of cerium is used.

However, Stoffer indicates that cerium possesses two highly stable oxides,  $CeO_2$  or  $Ce_2O_3$ , in the oxidation states of 3 and 4. *See column 2, lines 45-55.*

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Subramanian to select  $\text{CeO}_2$  as the stable oxide of cerium to be used as suggested by Stoffer in order to provide a desirable sheath coating of cerium oxide, because Subramanian teaches to use a stable oxide of cerium as the coating material, and Stoffer teaches that a well known highly stable oxide of cerium is  $\text{CeO}_2$ , which would have cerium in a +4 oxidation state (as oxygen has a +2 valence state).

5. Claims 1-5, 7, 9, 10 and 13-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Villiger et al (US 2001/003631) in view of Vine et al (US 4861618) and Liu, et al "Total Oxidation of Carbon Monoxide and Methane over Transition Metal-Fluorite Oxide Composite Catalysts" Article (hereinafter Liu Article).

Claims 1, 7, 9, 13: Villiger teaches a method for preparing a protected article. *Paragraphs [0001]-[0003]*. The article is provided. *Paragraph [0014] (component 1)*. A coating is formed on the component. *Paragraph [0014] (coating 10)*. The coating can be a thermal barrier coating. *Paragraph [0002] (with the function of increased temperature in use through thermal protective layers)*. To form the thermal barrier coating, first a primary ceramic coating is applied by thermal spraying, for example. *Paragraph [0017] (the base coating 10 ceramic can be yttria and zirconia, for example)*. Then, a sealing medium 2, which is an aqueous or organic solution containing a salt of an oxidizable metal in solution is applied to the exposed surface 11 of the coating 10. *Paragraphs [0014], [0019]*,

Art Unit: 1762

[0025] and [0027]. The solution can contain a cerium oxide precursor such as cerium acetate ( $\text{Ce}(\text{C}_2\text{H}_3\text{O}_2)_3 \cdot 3/2\text{H}_2\text{O}$ ), which is not "cerium oxide with cerium in the +4 oxidation state". Paragraph [0027]. The solution infiltrates the coating 10 from the exposed surface 11. Paragraph [0019]. The applied solution is then heated to form the oxide of the metal salt by means of oxygen <sup>80</sup>for the surroundings or from oxidizing agents in the solution. Paragraph [0020]. This would form cerium oxide in the case of cerium acetate. This would produce a sintering inhibitor region on the surface of the primary ceramic coating as cerium oxide is impregnated within the surface and on top of the ceramic coating 10.

Claims 3, 15: the article is in the form of a component for a gas turbine engine.

Paragraph [0037] (the blade for the gas turbine).

Claim 5, 17: the primary ceramic coating can be yttria stabilized zirconia.

Paragraphs [0017] and [0034] (the combination of yttria and zirconia provides yttria stabilized zirconia).

Villiger teaches all the features of these claims except (1) that a bond coating is used under the primary ceramic coating (claims 1, 9, 13), (2) that the formed cerium oxide is in the +4 oxidation state, (3) that the substrate is a nickel base superalloy (claims 2, 14), (4) the step of depositing the bond coat includes depositing an aluminum containing overlay bond coat (claims 4, 16), and (5) that the yttria stabilized zirconia is 7 percent yttria by weight.

However, Vine teaches that when applying thermal barrier layers to gas turbine components, it is well known to provide an aluminum containing overlay bond coating applied by plasma spraying before applying the ceramic thermal barrier coating by the thermal spray method of plasma spraying. *Column 2, lines 25-45 and column 1, lines 5-30.* Vine teaches that the bond coat helps provide beneficial performance of the thermal barrier coating. *Column 4, lines 55-65.* Furthermore, the substrate of such gas turbine components is well known to be nickel based superalloys. *Column 1, lines 20-35.* As well, the ceramic thermal barrier coating is zirconia stabilized with 6-8 wt% yttria, desirably 7 % yttria. *Column 6, lines 5-10 and 25-35 and column 2, lines 35-45.*

Moreover, Liu Article teaches that cerium acetate when heated in air provides cerium oxide. *Page 305, section 2.1 ("Cerium acetate (99.9%, Aldrich), heated for 4 hours at 750°C in air, was used as the primary precursor of La-free cerium oxide.")*. This cerium oxide is described as being  $\text{CeO}_2$ . *Page 305, section 2.1 ("The physical mixture of ceria and copper oxide,  $\text{CuO} + \text{CeO}_2$ , was prepared by blending the  $\text{CuO}$  and  $\text{CeO}_2$  powders with water . . .", indicating that the formed cerium oxide from the cerium acetate is  $\text{CeO}_2$ ).*

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Villiger to use a gas turbine component with a nickel base superalloy substrate and to provide an aluminum containing overlay bond coating applied by plasma spraying before applying the thermally sprayed ceramic thermal barrier coating as suggested by Vine with an expectation of providing a desirably protected thermal barrier coating made up of desirable components, because Villiger



Art Unit: 1762

teaches sealing a thermal sprayed ceramic thermal barrier coating on a gas turbine component, and Vine teaches that when providing a thermal sprayed ceramic thermal barrier coating on a gas turbine component, it is well known to provide that the component is a nickel base superalloy and that a plasma sprayed aluminum containing overlay bond coating is provided on the component before applying the ceramic thermal barrier coating and helps coating performance. Furthermore, it would further have been obvious to modify Villiger to provide that the ceramic thermal barrier coating is zirconia stabilized with 7 wt% yttria as suggested by Vine with an expectation of providing a desirably protective thermal barrier coating, because Villiger teaches that the thermal barrier coating material can be zirconia with yttria at, for example, 8% yttria, and Vine teaches that a desirable zirconia thermal barrier coating includes 6-8 wt% yttria, desirably 7 %. It would further have been obvious to modify the process of Villiger in view of Vine to select a precursor that provides  $\text{CeO}_2$  as the formed oxide, which would provide that the cerium oxide precursor is such that the resulting cerium oxide is in the +4 valence state as suggested by Liu Article with an expectation of desirable protective sealing results, because Villiger teaches to oxidize cerium acetate and to oxidize using oxygen from the surroundings and Liu Article teaches that it is well known that when cerium acetate is oxidized to provide cerium oxide,  $\text{CeO}_2$  is formed, which would have cerium in a +4 oxidation state (as oxygen has a +2 valence state), and thus Villiger teaches that a cerium oxide precursor that results in cerium oxide with cerium in the +4 valence state can be desirably used.

6. Claims 6 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Villiger in view of Vine and Liu Article as applied to claims 1-5, 7, 9, 10 and 13-17 above, and further in view of Ueda et al (US 5697992).

Villiger in view of Vine and Liu Article teaches all the features of these claims except using ammonium cerium sulfate as the precursor. Villiger does teach that salts of the oxidizable metal can be used as the precursors, and describes cerium nitrate and cerium acetate as possible precursors. *Paragraphs [0027] and [0027]*.

Ueda teaches that cerium oxide can be provided by providing a precursor of the oxide in liquid, and that a well known cerium compound precursor for this purpose that converts to cerium oxide by calcining is ammonium cerium sulfate. *See column 4, lines 20-30*. The calcining provides heating to perform the conversion. *Column 4, lines 20-30 and 40-50*. Heating methods include vacuum and non vacuum heating devices (which would provide heating in air). *See column 4, lines 60-68*. Ueda also teaches that cerium nitrates and cerium acetates are also known precursors for converting to metal oxides. *Column 4, lines 20-30*.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Villiger in view of Vine and Liu Article to use ammonium cerium sulfate as a precursor for cerium oxide as suggested by Ueda with an expectation of desirable formation of cerium oxide because Villiger in view of Vine and Liu Article teaches that salts of the oxidizable metal can be used as the precursors,

Art Unit: 1762

and describes cerium nitrate and cerium acetate as possible precursors and Ueda teaches that cerium acetate, cerium nitrates and ammonium cerium sulfate would all be known acceptable precursors for making cerium oxide by heating.

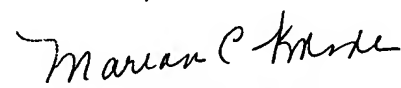
### *Conclusion*


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Katherine A. Bareford whose telephone number is (571) 272-1413. The examiner can normally be reached on M-F(6:00-3:30) with the First Friday Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on (571) 272-1423. The fax phone numbers for the organization where this application or proceeding is assigned are (571) 273-8300 for regular communications and for After Final communications.

Other inquiries can be directed to the Tech Center 1700 telephone number at (571) 272-1700.

Furthermore, information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
MARIAN C. NODE  
DIRECTOR  
TECHNOLOGY CENTER 1700

  
KATHERINE BAREFORD  
PRIMARY EXAMINER